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Palo Alto, California

October 29, 1959

This day I did discuss with Mr. Torsten Soderlund of the Servall Inc., centrifuge manufacturing company the following scheme for axial sedimentation (= swinging bucket effect). I had first conceived this scheme on Thursday October 16, 1959 and have discussed it with some of my colleagues in the interval (Berg; Baldwin; Kornberg; June Sanders among others.)

The essential feature of this proposal is the use of a simply machined 'batch bowl' type of centrifuge head in place of the relatively intricate swinging bucket type of head. The sample tube is weighted at the bottom; the bowl is partly filled with a fluid in which the sample tube is floated. The weighting of the tube aligns it along the gravitational gradient. In effect, when the bowl is at rest, the tube's axis will be vertical; when it is spinning at high speed, the tube axis will be radial with respect to the centrifuge axis. At all times, therefore, the axis of the tube will be at right angles to the plane of the liquid surface in the tube, and to all isosbestic planes in the contained liquid. It will therefore serve the same function as the variable inclination of the tube holder in a swinging-bucket type of centrifuge.

The main advantage of this system is the low cost and simplicity of construction of the head. By choice of fluids of proper density and viscosity it should be possible to stabilization the rotating fluid even at high speeds; also the buoyant support to the tubes should make it possible to use glass and other fragile materials for the tubes at higher speeds than is now practical. It should also be possible to do axial gradient centrifugation in much smaller heads, e.g., of the type used in air turbine centrifuges.

Some possible features not shown in the sketch below include:

1) Vanes in the rotor to help transfer angular momentum to the fluid

2) Restraining cord to the tubes to maintain inclination at low speeds (when tube might be pressed bodily against the wall of the fluid)

3) Profile of the head designed to give comparable depth of fluid when the head is either rotating or at rest. and to allow free inclination

4) Partitions to keep tubes at opposite sides of head for dynamical balance

5) submergence of entire tube in fmmiscible fluids of two densities.